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Request for grant of a patent

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1. Your reference

C1283/P

2. Patent application number

9726154.9

(The Patent Office will fill in this part)

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

PetroTechnik Limited
Maitland Road
Lion Barn Business Park
Needham Market, Ipswich
Suffolk IP6 8NZ

0643 358 5001

Patents ADP number (*if you know it*)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

Improvements in and relating to pipe fittings

5. Name of your agent (*if you have one*)

Keith W Nash & Co
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SOMMERVILLE & RUSHTON
45 GROSVENOR ROAD
ST ALBANS
HERTS
AL1 3AW

Patents ADP number (*if you know it*)

1206001

1511001

Form 51
26/11/98

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
(*if you know it*)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d))

c)

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.
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Continuation sheets of this form

Description 10

Claim(s) -

Abstract -

Drawing(s)

3 x 3

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10. If you are also filing any of the following, state how many against each item.

Priority documents

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination
(*Patents Form 10/77*)

Any other documents
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature Keith W Nash Date 10.12.97

Keith W Nash & Co, Agents

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr D L Roberts 01223 355477

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C1283/P

TITLE: IMPROVEMENTS IN AND RELATING TO PIPE FITTINGSField of the Invention

This invention relates to a fitting for providing a seal between a wall and a pipe passing through an opening in the wall, to a method of providing such a seal, and to the combination of a pipe, a wall and a fitting providing a seal between the two. The invention is particularly applicable to the provision of a seal between a pipe and a wall for a manhole chamber for a subterranean fuel tank or sump for a dispensing pump, for example in a petroleum forecourt installation.

Background to the invention

In petroleum forecourt installations, pipework running between dispensing pumps and a subterranean fuel storage tank passes into a manhole chamber which is situated directly above the manhole lid of the tank. The chamber is normally defined by an upstanding wall which, when viewed from above, can be of an octagonal, square or rectangular shape, and which includes apertures through which respective pipes pass.

It is desirable to provide a seal between each of the apertures and its respective pipe to avoid ingress of water into the manhole chamber. To that end, it is known to attach a fitting to a portion of the wall around the aperture and a rubber "boot" that sleeves over the pipe and is clamped to both the pipe and the fitting by, for example, jubilee clips. Some examples of fitting are bolted to the chamber wall, whilst other types of fitting provide inner and outer parts between which the wall is sandwiched, the inner and outer parts being held together by a screw-threaded connector which extends through the aperture.

Neither type of fitting provides a completely effective seal.

Consequently, both types of seal can allow water to leak into the manhole chamber and to accumulate in a pool in the bottom of the chamber. This in turn makes the maintenance of the chamber bottom and tank entrance extremely difficult and prohibitive.

Furthermore, it has been found that the removal and replacement of the rubber seals of conventional arrangements can also be extremely difficult and expensive.

Summary of the Invention

According to a first aspect of the invention, there is provided a fitting for providing a seal between a wall and a pipe passing through an opening in the wall, the fitting comprising a sleeve through which, with the fitting installed, the pipe passes, said sleeve, when installed, being sealed to the pipe, a surface which extends from the sleeve and is so shaped as to be able to be placed against the wall so as to surround said opening therein, and energy transfer means for enabling the surface or wall to be heated to cause the surface and wall to be fused or bonded together to seal the fitting against the wall.

It is believed that water which leaks through conventional fittings and seals does not pass between the sealing member, for example the rubber gasket seal, and the pipe, but instead passes between the fitting and the wall. By contrast, the present invention provides a fitting which, when installed, is sealed to the wall around the aperture, and which does not require attachment to the wall by any invasive method, for example bolts, which would require further apertures in the wall. Thus, a seal formed using a fitting in accordance with the present invention should be substantially watertight or at least far more effective than the seals provided by conventional fittings.

Preferably, the surface is of a fusible material, such as a thermoplastic (for example polyethylene) which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

Preferably, the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the surface.

The process by which two components are fused together as a result of electrical heating from a conductor (situated at or near the interface between the two components prior to fusing) is known as electrofusion. Electrofusion is normally used to provide seals at the join between two lengths of pipe, (particularly polyethylene pipe) in a pipeline. The same process can be used by a fitting in accordance with the present invention if the wall to which the fitting is to be fused is of a suitable thermoplastic material, such as polyethylene.

It is however possible for the fitting to be required for a wall which is of a material, for example fibreglass, which is not suitable for being attached to the fitting by electrofusion. In this case, therefore, the surface of the fitting preferably comprises an adhesive which is of a type which is activated by heat, wherein the heating of the surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall. The adhesive can be a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.

This type of fitting can be attached to a wall by a procedure similar to that used by the fitting which is bonded to a wall by electrofusion.

Preferably, the conduction means comprises a wire which is conveniently embedded within the surface. The surface may to

advantage be part of a flange which extends from the sleeve. Where the sleeve is of a substantially circularly symmetric cross-section, the flange is preferably radial.

If the energy transfer means comprises conduction means, the fitting preferably includes terminals, for connecting the conduction means to a current supply, which are accessible from the opposite side of the flange from the surface.

According to a second aspect of the invention, there is provided a fitting in accordance with the first aspect of the invention and a sealing member for sealing the sleeve of the fitting to a pipe passing therethrough. The sealing member may be incorporated into the sleeve, or may be formed as an initially separate fitting which is subsequently attached to the sleeve after the fitting has been installed.

Preferably, the sealing member is resilient, and there is provided clamping means (such as jubilee clips) for clamping the sealing member to the pipe and/or the sleeve. Conveniently, the sealing member comprises a rubber sleeve.

According to a third aspect of the invention, there is provided a method of providing a seal between a pipe and a wall having an opening through which the pipe passes, the method comprising the steps of applying a fitting to the pipe, the fitting having a sleeve through which the pipe passes and a surface which is placed against a portion of the wall around the opening so as to surround the latter; heating the surface and/or said portion of the wall thereby to cause the wall and the surface, and hence the fitting to become fused or bonded together, and sealing the sleeve to the pipe before, during or after said heating step.

Preferably, said heating is achieved by passing an electric current through conduction means in the vicinity of the portion

of the wall and the surface. The conduction means may be provided on the wall, but is preferably carried by the surface.

Conveniently, the materials constituting the wall and the surface are such that the surfaces are fused together by a process of electrofusion.

Where other materials are used, however, the method also includes providing an adhesive which is activated by said heating to cause the fitting to be bonded to the wall. The adhesive may form the surface on the fitting. Additionally or alternatively, the adhesive may be provided on the wall.

Preferably, the wall comprises a manhole chamber wall for a subterranean fuel tank.

The invention also lies in a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the chamber to cause the fitting and/or chamber to be fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

According to a further aspect of the invention, there is provided a pair of components adapted to be bonded together wherein one of the components carries a heat activated adhesive and the components also include energy transfer means for heating the adhesive to enable the components to be bonded together.

Brief Description of the Drawings

The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a partially cut-away side view of part of a petroleum forecourt installation which includes a tank having a manhole chamber, having a fitting in accordance with the invention;

Figure 2 is a cut-away side elevation, to an enlarged scale, showing the fitting in position on the manhole chamber wall;

Figure 3 is a front elevational view of the fitting (prior to installation); and

Figures 4 and 5 are sectional side views of two further embodiments of fitting in accordance with the invention, each drawing showing the fitting when installed.

Detailed Description

The petroleum forecourt installation shown in Figure 1 comprises a pair of dispensing pumps 1 and 2 connected to a subterranean tank 3 through a pipeline 4. The pipeline 4 is formed from contiguously arranged sections of polyethylene pipe. The pipeline 4 extends from the pumps 1 and 2 into a manhole chamber 6 immediately above the tank 3. The chamber 6 is defined by a polyethylene member 8 having a side wall 10 and a base 12.

Figure 1 shows two lines extending from the pipeline 4 into the tank 3. These lines relate to two alternative forms of fuel supply system and are both shown for the sake of completeness.

~~In practice, only one of the lines would extend from the pipeline 4 into the manhole chamber 6.~~ One of those lines is a suction line 14 which is used where the dispensing pumps 1 and 2 are fitted with suction pumps. The alternative line, reference 16, is a pressure line connected to the pipeline 4 via a pump 18 which is operable to propel fuel from the tank 3 to the pumps 1 and 2.

It can be seen from Figure 1 that the wall 10 has to be apertured in order to allow the pipeline 4 to pass into the chamber 6. In order to prevent water leaking from the surrounding ground (here denoted by reference numeral 20) into the chamber 6 through the aperture, the pipe is sealed to the cylindrical wall 10 by means of a fitting 22 shown in more detail in Figures 2 and 3.

The fitting comprises a cylindrical sleeve 22 having an outwardly projecting radial flange 24 at one end. The flange and sleeve define a central passage through which the pipe of the pipeline 4 extends. It can also be seen from Figure 2 that the sleeve extends through the aperture in the wall 10 so that the sleeve is at least partially accommodated within the chamber 6, whilst the flange 24 is situated outside the chamber.

The flange 24 has a surface 26 which is flat, to enable the surface to be placed against the wall 10 as shown in Figure 2. Accordingly, the flange 24 makes contact with the wall 10 in a region which surrounds the opening through which the pipe of the pipeline 4 passes. A wire 28 is embedded in the surface 26 in a generally spiral shape as shown in Figure 3, and the ends of the wire 28 are connected to electric terminals 30 and 32.

The sleeve 22 also receives a rubber boot 34 which is clamped at one end over the sleeve by a jubilee clip 36. The opposite end of the boot 34 is clamped onto the pipe of the pipeline 4 by a jubilee clip 38.

When the fitting (constituted by the sleeve 22 and flange 24) is installed, the flange 24 is initially pressed against the wall 10 and the terminals 30 and 32 connected to a source of electric current. The current passes through the wire 28, causing the latter to heat the adjacent surface of the flange 24 (and part of the tank 10), to cause the flange 24 and wall

10 to fuse together in a disc-shaped region which surrounds the opening in the tank 10. This not only retains the fitting on the wall 10 but also provides a seal which encircles the opening in the tank, and thus prevents water passing between the flange and the wall 10 through the opening of the latter into the chamber 6. The passage of any water which travels along the surface of the part of the pipe outside the chamber 6 will be blocked by the seal 34.

If the chamber wall were to be made of fibreglass, a modified version of fitting would be used. The modified version is identical to the version shown in Figures 2 and 3, apart from the inclusion of a layer of adhesive which would constitute the surface 26 on the flange 24 and which overlies the heating wire. The adhesive is a thermoplastic or cross-linking adhesive which once heated, forms a bond between the flange 24 and the wall 10. Again, since the bond will surround the opening in the wall 10, it also acts as a seal to prevent the ingress of water.

It will be appreciated that various modifications to the fitting and/or chamber wall are possible within the scope of the invention. Thus, for example, the wire 28 could be embedded in the chamber wall 10, and the latter could carry the adhesive coating instead of, or in addition to, the fitting 24.

Figures 4 and 5 show alternative forms of fitting when installed on the chamber wall 10.

The fitting shown in Figure 4 has an outer circular back plate 40 which is formed as a radial flange on a sleeve 42, and which carries a spiral winding of a wire 44 connectable to an electric current source by means of terminals 46 and 48.

The flange 40 and sleeve 42 are formed of a thermoplastics material which can be fused to the (thermoplastic) wall 10 in a similar fashion to the fitting shown in Figure 2.

Alternatively, either the flange 40 or wall 10 can carry a heat activated adhesive if the wall 10 is of a material not suitable for electrofusion welding.

The outer surface of the sleeve 42 carries a screw-threaded portion which enables the sleeve, and hence the flange, to be screwed onto an outer sleeve 50 from which a further radial flange 52 projects. The flange 52 is pressed against the inside of the wall 10, and includes a circular groove which accommodates an O-ring seal 54 for preventing the ingress of any water which manages to breach the seal between the flange 40 and outside of the wall 10.

The sleeve 50 carries a rubber boot 56, clamped to the sleeve by a jubilee clip 58. The boot is also clamped to the pipe of the pipeline 4 by a jubilee clip 60, and serves a similar purpose to that of the boot 34.

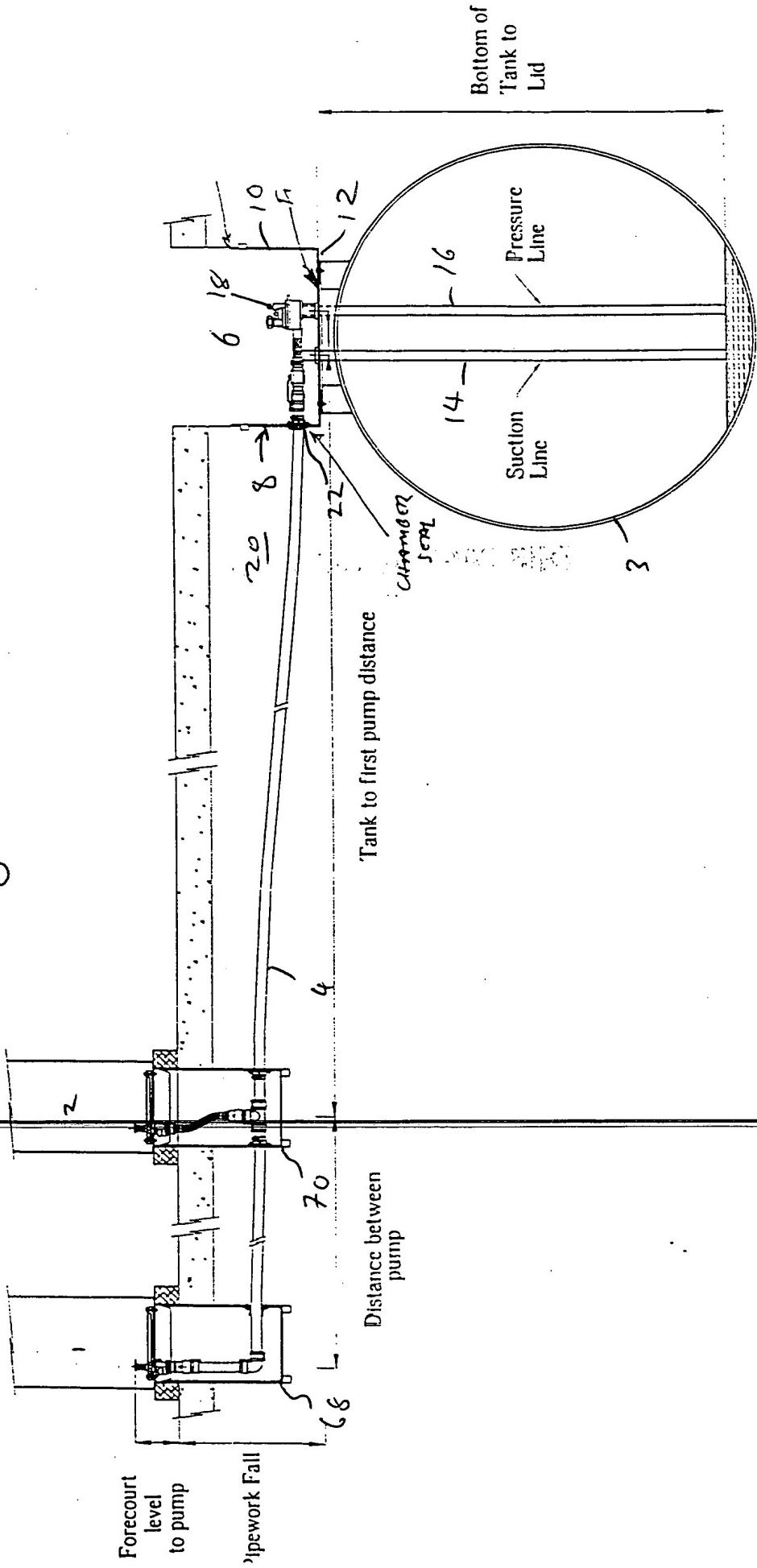
As the outside of the fitting (i.e. flange 40 and sleeve 42) is securely bonded/fused to the wall 10, the removal of the sleeve 50 (and flange 52) for repair or maintenance can be readily done without the need to have any access to the exterior of the wall 10.

Figure 5 shows the same fitting when modified to accept a pipeline which uses secondary containment (in which fuel is conveyed along an inner pipe 62 which extends through an outer pipe 64). It can be seen that the only modification to the fitting is to the boot seal, and associated jubilee clips which are now arranged to provide a seal between the fitting and both the pipes 64 and 62 (three jubilee clips 60, 60' and 58 are used to that end). It can be seen that the boot 56 is also configured to accommodate part of a leak detection sensor for detecting any leaks of fuel from the inner pipe 62 into the interstitial space between the pipes 62 and 64.

A similar arrangement of fittings to those shown in Figures 2,

4 or 5 are used to seal the pipeline 4 to each of a pair of sumps 68 and 70 (which are rectangular in plan) beneath the pumps 1 and 2 respectively. A respective fitting is installed on the sumps 68 and 70 about each aperture (in the sumps) through which the pipeline 4 passes.

Fig 1



Total Head = Static Head + Dynamic Head

$$= (\text{Bottom of Tank to Lid} + \text{Pipework Fall} + \text{Forecourt Level to Pump}) + (\text{Pipework Assembly Friction Losses})$$

Figure 1

Reference:	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	999

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Fig 2

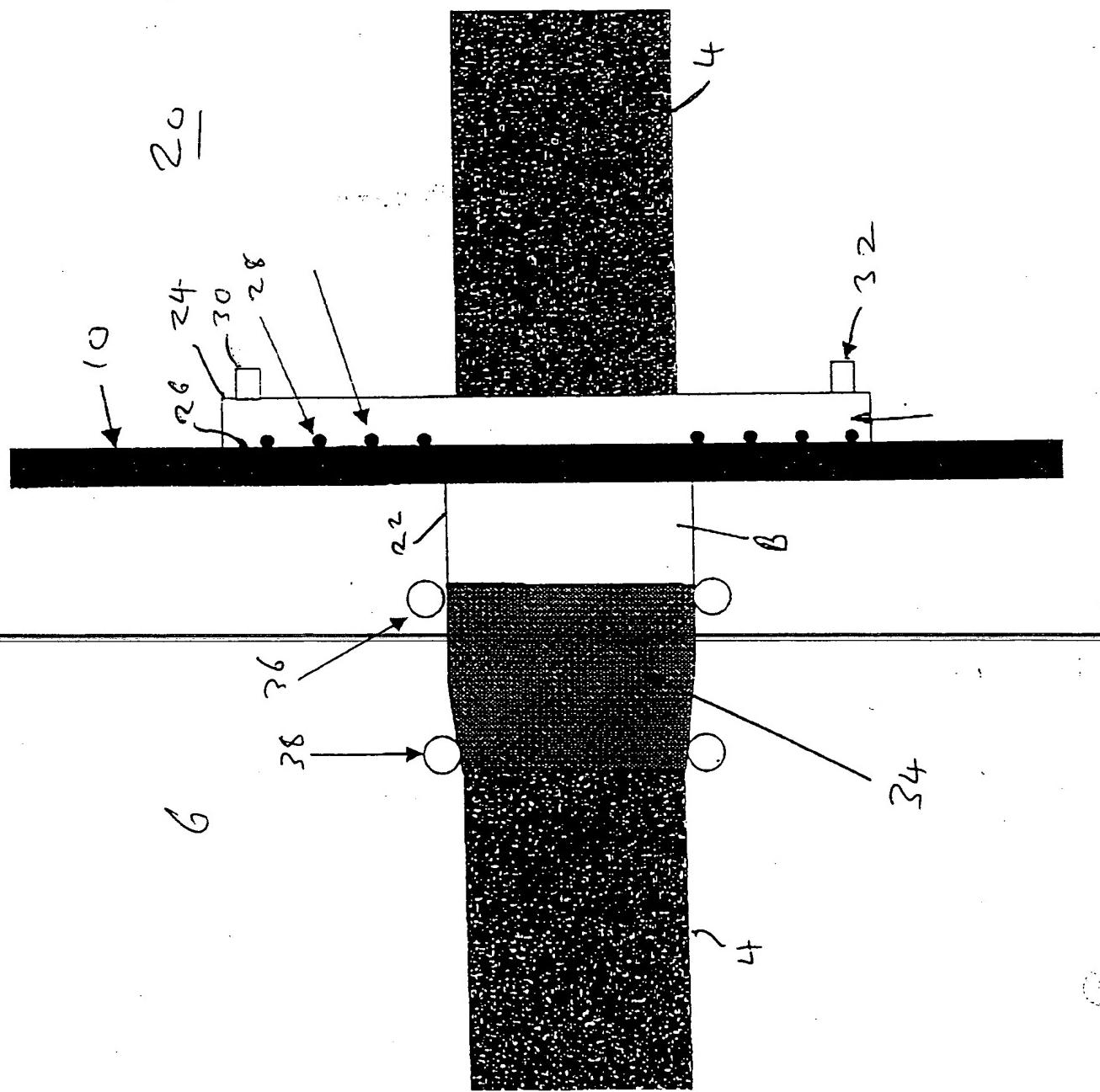
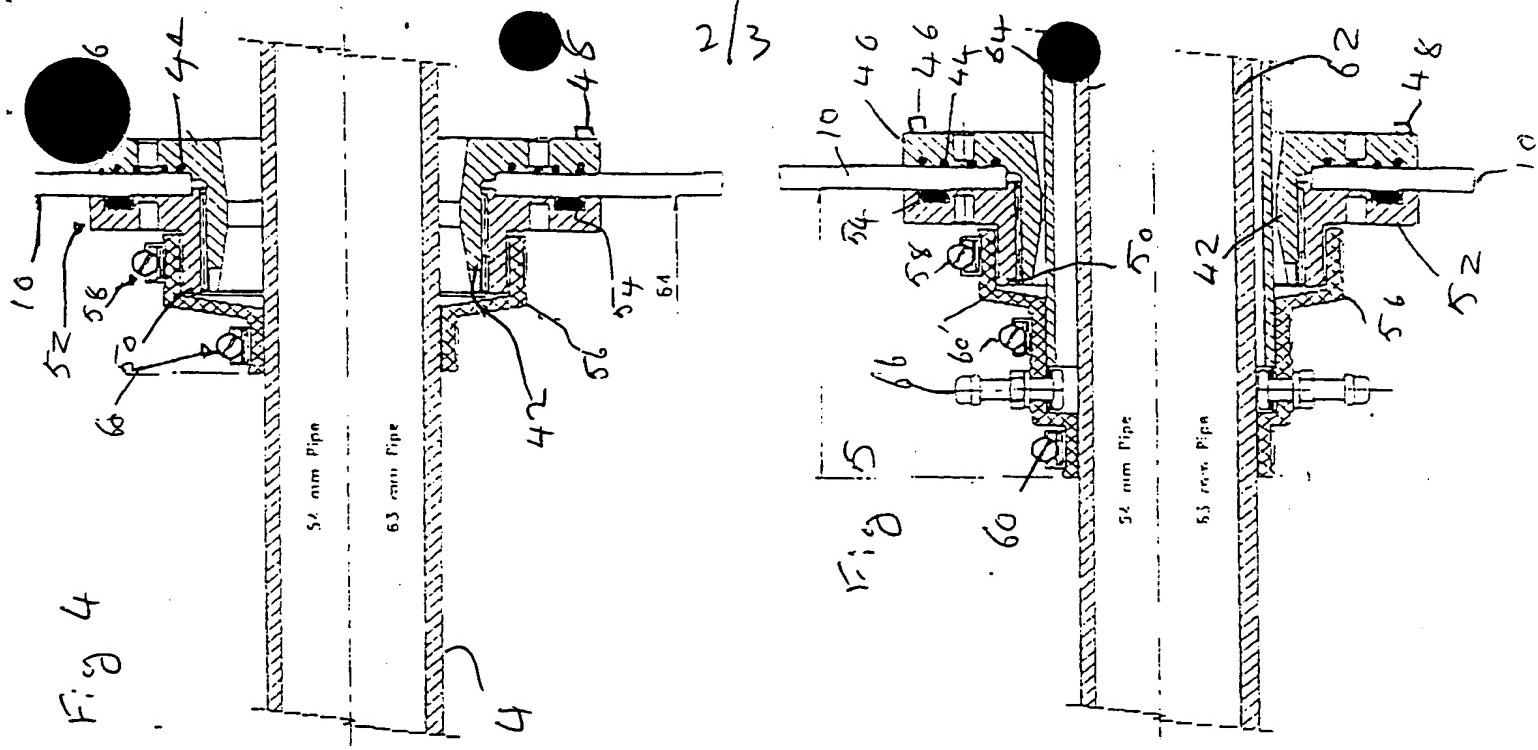


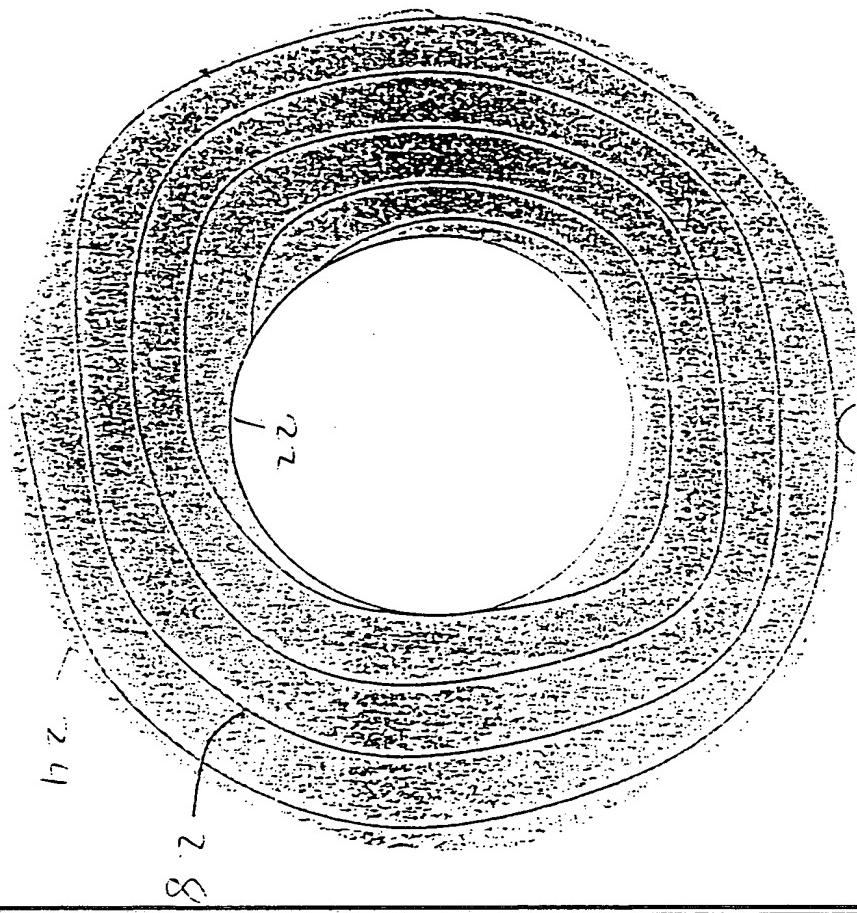
Fig 4



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FIG 3



TR

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Somerville + Rushton

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